Photosynthesis Lab

Background

Carbon dioxide + Water → Glucose + Oxygen $6CO_2 + 6H_2O \rightarrow C_6H_{12}O6 + 6O_2$

In this lab, you will be using leaf disks, to assay the net rate of photosynthesis under various lighting conditions. Leaf disks normally float, however when the air spaces are infiltrated with carbon dioxide, the overall density of the lead disk increases and the leaf disk sinks. When sodium bicarbonate is added to the water, the bicarbonate ion acts as a carbon source for photosynthesis causing the leaf disks to sink. As photosynthesis proceeds, oxygen is released into the interior of the leaf, which changes its buoyancy causing the disk to rise. Since cellular respiration is taking place at the same time in the leaf, the oxygen generated by photosynthesis is consumed. As a result, the rate that the disks rise is indirectly proportional to the net rate of photosynthesis.
Purpose: To observe the rate of photosynthesis under different lighting conditions (light, ambient light, dark)

Question: How does light color affect the rate of photosynthesis?

Hypothesis: *Record your prediction. If…..then….because……*

Materials:

- Sodium	- Liquid Soap	- Hole Punch	- Spoon
- Bicarbonate (baking soda)	- Syringe	- Timer	- Beaker
	- Leaf	- Light Source	- Glass petri dish

Procedure:

1. Fill a beaker with 100mL
2. Weigh 1.0g of baking soda ($NaHCO_3$) and mix it in the water
3. Add 1 drop of soap to the bicarbonate solution. If your solution generates excessive suds, add more water and bicarbonate
4. Add 1 drop of food coloring to our beaker to make your assigned color
5. Hole punch at least 10 uniform leaf disks in texture and thickness avoiding major leaf veins
6. Remove the plunger of the syringe and place 10 leaf disks in the syringe barrel
7. Replace the plunger being careful not to crush the leaf disks. Push on the plunger until only a small volume of air and leaf disk remain in the barrel
8. Draw a small volume of the sodium bicarbonate solution into the syringe. Invert the syringe and tap the syringe to suspend the leaf disks in the solution.
9. Push the plunger removing as much air a possible from the syringe.
10. Hold a finger over the syringe opening and draw back on the plunger to create a vacuum. Hold this for 10 seconds while swirling the syringe to further suspend the leaf disks in solution.
11. Let off the vacuum and repeat step 8 if needed 2-3 more times until all leaf disks sink.
12. Pour the disks and solution into the labeled cup
13. Place the beaker under the corresponding light conditions and begin timing.
14. Gently swirl the cup with a stir stick to dislodge any disks that are stuck to each other or on the side of the cup
15. Record the number of floating disks at the end of each time period in the table
16. Keep time for 25 minutes.

Data

Red	
Time (min)	# of leaf disks floating
1	
5	
10	
15	
20	
25	
Rate	

Orange	
Time (min)	# of leaf disks floating
1	
5	
10	
15	
20	
25	
Rate	

Yellow	
Time (min)	# of leaf disks floating
1	
5	
10	
15	
20	
25	
Rate	

Green	
Time (min)	# of leaf disks floating
1	
5	
10	
15	
20	
25	
Rate	

Blue	
Time (min)	# of leaf disks floating
1	
5	
10	
15	
20	
25	
Rate	

Purple	
Time (min)	# of leaf disks floating
1	
5	
10	
15	
20	
25	
Rate	

White	
Time (min)	# of leaf disks floating
1	
5	
10	
15	
20	
25	
Rate	

Data Analysis

1. Graph your data. Label the graph, both axes and provide a legend to distinguish each trial.
2. What was the rate of photosynthesis for each light source? How many leaves floated/minute?
3. What was the role of the sodium bicarbonate in this experiment?

Conclusion

Write a CER conclusion to answer the question: How does light color affect the rate of photosynthesis? 8